REMARKS

This paper is responsive to a Final Office action dated September 29, 2006. Claims 1, 3-26 and 28-60 are pending. Claims 38-54 are withdrawn from consideration. Claim 26 stands rejected under 35 U.S.C. § 102(b) as being anticipated by U. S. Patent No. 5,949,226 to Sawtell (hereinafter, "Sawtell"). Claims 3-26, 28-37, and 55-60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sawtell in combination with U. S. Patent No. 5,568,045 to Koazechi (hereinafter, "Koazechi"). Claims 1, 20, 26, 55, and 59-60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U. S. Patent No. 5,563,502 to Akioka et al. (hereinafter, "Akioka") in combination with Koazechi. Claims 3, 7-19, 21-25, 28-37, and 56-57 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Akioka in combination with Koazechi. Claims 4-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U. S. Patent No. 6,198,267 to Bakker et al. (hereinafter, "Bakker") in combination with U. S. Patent No. 5,568,045 to Pennock (hereinafter, "Pennock").

Interview Summary

Applicants appreciate the interview granted by Examiner Patel to the undersigned on November 21, 2006 in which the Information Disclosure Statement filed September 20, 2006 was discussed. The Examiner agreed to consider the reference cited in the IDS and to return an initialed copy to the Applicants.

Claim Rejections Under 35 U.S.C. § 102

Claim 26 stands rejected under 35 U.S.C. § 102(b) as being anticipated by Sawtell. Applicants respectfully maintain that Sawtell, alone or in combination with other references of record, fails to teach or suggest

> a base current proportional to a voltage difference between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor,

as required by claim 26. Sawtell teaches an exponential transconductance stage that converts a voltage control signal, V_C, into an output current signal, I_C, which is exponentially related to a differential voltage. Col. 7, lines 7-44; col. 8, lines 29-34; Figs. 3 and 4. The exponential transconductance stage of Sawtell includes differential input voltage generation circuit 465 that applies a voltage ΔV across base terminals of transistors 425 and 426. Col. 9, lines 14-35. In contrast, claim 26 requires forming a voltage difference across a first resistor coupled to a base of the first bipolar transistor, the voltage difference being between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor. Forming a voltage across the base terminals of two transistors of Sawtell fails to teach or suggest forming a voltage difference across a first resistor coupled to a base of the first bipolar transistor, the voltage difference being between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor. Since Sawtell does not disclose or suggest that limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 26 and all claims dependent thereon, be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

Claims 3-26, 28-37, and 55-60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sawtell in combination with Koazechi. Regarding claim 4, Applicants respectfully maintain that the Office fails to establish a *prima facie* case of obviousness. The Office action fails to point out where Sawtell or Koazechi teaches or suggests, and Applicants respectfully maintain that neither Sawtell nor Koazechi teaches or suggests

> a low-beta transistor,

as required by claim 4. Accordingly, Applicants respectfully request that the rejection of claim 4 and all claims dependent thereon, be withdrawn.

Regarding claim 26, Applicants respectfully maintain that Sawtell, alone or in combination with Koazechi, fails to teach or suggest

> a base current of a first bipolar transistor, the base current being proportional to a voltage difference between a base-emitter voltage of a second bipolar

> transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor,

as required by claim 26. Sawtell fails to teach or suggest the claimed limitation, as described above with regards to the rejection of claim 26 under 35 U.S.C. § 102(b). Koazechi fails to compensate for the shortcomings of Sawtell. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest a base current of a first bipolar transistor, the base current being proportional to a voltage difference between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor, as required by claim 26. Since neither Sawtell nor Koazechi teaches or suggests the limitations of claim 26, Applicants respectfully request that the rejection of claim 26 and all claims dependent thereon, be withdrawn.

Regarding claim 55, Applicants respectfully maintain that Sawtell, alone or in combination with Koazechi, fails to teach or suggest that

> a means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor,

as required by claim 55. Sawtell teaches an exponential transconductance stage that converts a voltage control signal, V_C, into an output current signal, I_C, which is exponentially related to a differential voltage. Col. 7, lines 7-44; col. 8, lines 29-34; Figs. 3 and 4. The exponential transconductance stage of Sawtell includes differential input voltage generation circuit 465 that applies a voltage ΔV across base terminals of transistors 425 and 426. Col. 9, lines 14-35. In

contrast, claim 55 requires a means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor. Forming a voltage across the base terminals of two transistors of Sawtell fails to teach or suggest a means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across a resistor.

Koazechi fails to compensate for the shortcomings of Sawtell. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest a means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor, as required by claim 55. Since neither Sawtell nor Koazechi teaches or suggests the limitations of claim 55, Applicants respectfully request that the rejection of claim 55 and all claims dependent thereon, be withdrawn.

Regarding claim 59, the Office action fails to point out where Sawtell and/or Koazechi teach or suggest, and Applicants respectfully maintain that Sawtell, alone or in combination with Koazechi and/or other references of record, fails to teach or suggest

> a base-collector voltage of a first bipolar transistor equal to a voltage difference between two base-emitter voltages biased at different current densities,

as required by claim 59. Since neither Sawtell nor Koazechi teaches or suggests the limitations of claim 59, Applicants respectfully request that the rejection of claim 59 and all claims dependent thereon, be withdrawn.

Claims 1, 20, 26, 55, and 59-60 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Akioka in combination with Koazechi. Regarding claim 1, Applicants respectfully maintain that Akioka, alone or in combination with Koazechi or other references of record, fails to teach or suggest

> the base current is proportional to a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities, the voltage difference being formed across the resistor,

as required by claim 1. The Office action relies on resistor R3, which is coupled to the base of bipolar transistor Q8, of Akioka to supply this teaching. Fig. 2, 3, and 8. Akioka teaches forming a difference voltage between base-to-emittter voltages VBE of respective bipolar transistors Q1 and Q2 across a resistive element R2. Col. 4, lines 40-42. Resistive element R2 is coupled between the emitter of bipolar transistor Q2 and ground. Fig. 2, 3, and 8. In addition, Akioka teaches that bipolar transistor Q8 is configured to generate a voltage VBE which is added to K*VT to provide an output voltage VREF free of temperature dependence. Col. 5, lines 1-4. Akioka teaches that the current proportional to the thermal voltage VT flows through M4 and that this current also flows through the resistive element R3. Col 4, line 63-col. 5, line 1. Nowhere does Akioka teach or suggest a bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an absolute temperature, and a resistor coupled to the base of the bipolar transistor, wherein the base current is proportional to a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities, the voltage difference being formed across the resistor, as required by claim 1.

Koazechi fails to compensate for the shortcomings of Akioka. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest a bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an

absolute temperature, and a resistor coupled to the base of the bipolar transistor, wherein the base current is proportional to a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities, the voltage difference being formed across the resistor, as required by claim 1. Since Akioka, alone or in combination with other references of record, fails to teach or suggest the limitations of claim 1, Applicants respectfully request that the rejection of claim 1 and all claims dependent thereon be withdrawn.

Regarding claim 26, Applicants respectfully maintain that Akioka, alone or in combination with Koazechi or other references of record, fails to teach or suggest that a

> base current is proportional to a voltage difference between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor,

as required by claim 26. The Office action relies on resistor R3, which is coupled to the base of bipolar transistor Q8, of Akioka to supply this teaching. Fig. 2, 3, and 8. Akioka teaches forming a difference voltage between base-to-emittter voltages VBE of respective bipolar transistors Q1 and Q2 across a resistive element R2. Col. 4, lines 40-42. Resistive element R2 is coupled between the emitter of bipolar transistor Q2 and ground. Fig. 2, 3, and 8. In addition, Akioka teaches that bipolar transistor Q8 is configured to generate a voltage VBE which is added to K*VT to provide an output voltage VREF free of temperature dependence. Col. 5, lines 1-4. Akioka teaches that the current proportional to the thermal voltage VT flows through M4 and that this current also flows through the resistive element R3. Col 4, line 63-col. 5, line 1. Nowhere does Akioka teach or suggest base current is proportional to a voltage difference between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor, as required by claim 26.

Koazechi fails to compensate for the shortcomings of Akioka. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears

across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest base current is proportional to a voltage difference between a base-emitter voltage of a second bipolar transistor and a base-emitter voltage of the first bipolar transistor, the voltage difference being formed across a first resistor coupled to a base of the first bipolar transistor, as required by claim 26. Since Akioka, alone or in combination with other references of record, fails to teach or suggest the limitations of claim 26, Applicants respectfully request that the rejection of claim 26 and all claims dependent thereon be withdrawn.

Regarding claim 55 Applicants respectfully maintain that Akioka, alone or in combination with Koazechi or other references of record, fails to teach or suggest

> means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor,

as required by claim 55. The Office action relies on resistor R3, which is coupled to the base of bipolar transistor Q8, of Akioka to supply this teaching. Fig. 2, 3, and 8. Akioka teaches forming a difference voltage between base-to-emittter voltages VBE of respective bipolar transistors Q1 and Q2 across a resistive element R2. Col. 4, lines 40-42. Resistive element R2 is coupled between the emitter of bipolar transistor Q2 and ground. Fig. 2, 3, and 8. In addition, Akioka teaches that bipolar transistor Q8 is configured to generate a voltage VBE which is added to K*VT to provide an output voltage VREF free of temperature dependence. Col. 5, lines 1-4. Akioka teaches that the current proportional to the thermal voltage VT flows through M4 and that this current also flows through the resistive element R3. Col 4, line 63-col. 5, line 1. Nowhere does Akioka teach or suggest means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor, as required by claim 55.

Koazechi fails to compensate for the shortcomings of Akioka. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest means for developing the current proportional to absolute temperature includes a resistor coupled to a base of the first bipolar transistor, a voltage difference between two base-emitter voltages of bipolar transistors configured to have different current densities being formed across the resistor, as required by claim 55. Since Akioka, alone or in combination with other references of record, fails to teach or suggest the limitations of claim 55, Applicants respectfully request that the rejection of claim 55 and all claims dependent thereon be withdrawn.

Regarding claim 59, Applicants respectfully maintain that Akioka, alone or in combination with Koazechi or other references of record, fails to teach or suggest that

> a base-collector voltage of a first bipolar transistor equals a voltage difference between two base-emitter voltages biased at different current densities,

as required by claim 59. The Office action relies on resistor R3, which is coupled to the base of bipolar transistor Q8, of Akioka to supply this teaching. Fig. 2, 3, and 8. Akioka teaches forming a difference voltage between base-to-emittter voltages VBE of respective bipolar transistors Q1 and Q2 across a resistive element R2. Col. 4, lines 40-42. Resistive element R2 is coupled between the emitter of bipolar transistor Q2 and ground. Fig. 2, 3, and 8. In addition, Akioka teaches that bipolar transistor Q8 is configured to generate a voltage VBE which is added to K*VT to provide an output voltage VREF free of temperature dependence. Col. 5, lines 1-4. Akioka teaches that the current proportional to the thermal voltage VT flows through M4 and that this current also flows through the resistive element R3. Col 4, line 63-col. 5, line 1. Nowhere does Akioka teach or suggest a base-collector voltage of a first bipolar transistor equals a voltage difference between two base-emitter voltages biased at different current densities, as required by claim 59.

Koazechi fails to compensate for the shortcomings of Akioka. Koazechi teaches the voltage difference DVBE between base-emitter voltages VBE20 and VBE24, which appears

across resistor 2. Col. 4, lines 14-21. Resistor 2 of Koazechi is coupled to the emitter of transistor 24. Figure 2. Nowhere does Koazechi teach or suggest a base-collector voltage of a first bipolar transistor equals a voltage difference between two base-emitter voltages biased at different current densities, as required by claim 59. Since Akioka, alone or in combination with other references of record, fails to teach or suggest the limitations of claim 59, Applicants respectfully request that the rejection of claim 59 and all claims dependent thereon be withdrawn.

Claims 3, 7-19, 21-25, 28-37, and 56-57 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Akioka in combination with Koazechi. Regarding claim 3, Applicants respectfully maintain that the Office fails to establish a *prima facie* case of obviousness. The Office action fails to provide a reference of record that teaches or suggests that

> a reference voltage produced by the voltage reference generator is proportional to a parabolic function of temperature,

as required by claim 3. Akioka teaches "a circuit for generating a constant voltage, free of dependence on temperature changes." Abstract. Koazechi teaches generating a stable reference voltage with respect to changes in temperature. Col. 1, lines 9-17. Nowhere do the references of record teach or suggest a voltage reference generator generating a reference voltage that is proportional to a parabolic function of temperature, as required by claim 3. Rather, the Office impermissibly introduces hindsight into the obviousness analysis. In particular, the Office action implies that it would have been obvious to one of skill in the art at the time of invention to generate a reference voltage proportional to a parabolic function of temperature because a parabolic function of temperature function and its suitability for a voltage reference generator is known in the art. However, the Office fails to provide a reference to support this position. "'To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.'" In re Zurko, 42 USPQ2d 1476, 1479 (Fed. Cir. 1997) (citing W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983)).

Since the Office fails to provide a reference that teaches or suggests a reference voltage produced by the voltage reference generator that is proportional to a parabolic function of temperature, Applicants respectfully request that the rejection of claim 3 be withdrawn.

Regarding claim 29, Applicants respectfully maintain that the Office fails to establish a *prima facie* case of obviousness. The Office action fails to provide a reference of record that teaches or suggests

> adjusting an effective slope of the reference voltage as a function of temperature according to a first resistor,

as required by claim 29. Akioka teaches "a circuit for generating a constant voltage, free of dependence on temperature changes." Abstract. Koazechi teaches generating a stable reference voltage with respect to changes in temperature. Col. 1, lines 9-17. Nowhere do the references of record teach or suggest adjusting an effective slope of the reference voltage as a function of temperature according to a first resistor, as required by claim 29. Rather, the Office impermissibly introduces hindsight into the obviousness analysis. "'To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.'" In re Zurko, 42 USPQ2d 1476, 1479 (Fed. Cir. 1997) (citing W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983)). Since the Office fails to provide a reference that teaches or suggests adjusting an effective slope of the reference voltage as a function of temperature according to a first resistor, Applicants respectfully request that the rejection of claim 29 be withdrawn.

Claims 4-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U. S. Patent No. 6,198,267 to Bakker in combination with U. S. Patent No. 5,568,045 to Pennock.

Regarding claim 4, Applicants respectfully maintain that Bakker, alone or in combination with Pennock or other references of record, fails to teach or suggest

> a first bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an absolute temperature,

as required by claim 4. In the background of the invention, Bakker teaches a current generator including a resistor coupled between a drain of a PMOS-transistor and an emitter of a bipolar transistor. Col. 1, lines 28-30. That current generator also includes an operational amplifier that

> controls a control voltage at the gates of the first and second PMOS-transistors in such a manner that the voltage difference between the drains of the first and the second PMOS-transistors is virtually equal to zero. By appropriate dimensioning of the components the voltage across the resistor is proportional to the absolute temperature. Also the currents flowing through the first and the second PMOS-transistors are proportional to the absolute temperature.

Col. 1, lines 36-45. Nowhere does Bakker teach or suggest that the current generator described in the background of the invention includes a first bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an absolute temperature, as required by claim 4.

Bakker teaches further the circuits of Figure 1 and 2, which include an output RG_0 that is coupled to an output transistor M_1 and resistor R_2. Bakker teaches further that

> regulation means RGMNS regulates the voltage difference between the emitters of the first and the second bipolar transistors Q_1 and Q_2 to virtually zero volt by adapting the current flowing through the second resistor R_2. The reference current can be taken from the output terminal IPTAT. If the quotient of the value of the current delivered by the first current source I_1 and the value of the current delivered by the second current source I_2 is equal to the quotient of the value of the second resistor R_2 and the value of the first resistor R_1, then the value of the reference current is substantially dependent on the value of the absolute temperature.

Col.. 3, line 65-col. 4, line 1. The current generators of Figures 1 and 2 of Bakker develop a voltage proportional to absolute temperature across a resistor that is coupled to an output RG_0, which is coupled to an output transistor M1. Nowhere does Bakker teach or suggest that developing a voltage proportional to absolute temperature across a resistor that is coupled to an output RG_0, which is coupled to an output transistor M1, of the current generators of Figure 1

and 2 includes a first bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an absolute temperature, as required by claim 4.

Neither the current generator of the background section of Bakker nor the current generators of Figures 1 and 2 of Bakker teach or suggest the limitations of claim 4. Pennock fails to compensate for the shortcomings of Bakker. Pennock teaches techniques for generating a temperature dependent signal including two bipolar transistors configured to operate at different current densities. Abstract; Figures 3a-d, 4, and 5. Nowhere does Pennock teach or suggest a first bipolar transistor configured to amplify a base current of the first bipolar transistor, the base current being proportional to an absolute temperature, as required by claim 4.

For at least these reasons, Applicants respectfully maintain that claim 4 distinguishes over Bakker, Pennok, and all references of record. Accordingly, Applicants respectfully request that the rejection of claim 4 and all claims dependent thereon, be withdrawn.

In summary, all claims are believed to be allowable over the art of record, and a Notice of Allowance to that effect is respectfully solicited. Nonetheless, if any issues remain that could be more efficiently handled by telephone, the Examiner is requested to call the undersigned at the number listed below.

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Respectfully submitted,

Mark Zagorin, Reg. No. 36,067
Attorney for Applicant(s)
(512) 338-6311 (direct)
(512) 338-6300 (main)
(512) 338-6301 (fax)